What is claimed is:

1. A color signal interpolator comprising:

a first interpolator which receives 5 x 5 pixel window data, and performs a first interpolation for each of center pixels R and B, wherein the data are horizontal linear low pass filter (LPF) filtered and vertical band pass filter (BPF) filtered, and the data that is vertical linear LPF filtered and horizontal BPF filtered, and data are nonlinear LPF filtered and the sum of the filtered data is output as first interpolation data G';

a second interpolator which receives the 5 x 5 pixel window data, and performs a second interpolation for each of center pixels R and B, wherein the data are high pass filter (HPF) filtered and the data is nonlinear LPF filtered are added, and the sum of the filtered data is output as second interpolation data B' and R', respectively;

a third interpolator which receives the 5 x 5 pixel window data, and performs a third interpolation for each of center pixels R, B, and G, wherein the data are vertical BPF filtered and the data are horizontal BPF filtered, and the sum of the filtered data is output as third interpolation data R', B', or G', respectively;

a fourth interpolator which receives the 5 x 5 pixel window data, and performs fourth interpolation for each of center pixels Gr and Gb, wherein the data are vertical linear LPF filtered and horizontal BPF filtered and the data are nonlinear LPF filtered are added, and the sum of the filtered data is output as fourth interpolation data B' or R', respectively; and

a fifth interpolator which receives the 5 x 5 pixel window data, and performs fifth interpolation for each of center pixels Gr and Gb, wherein the data are horizontal linear LPF filtered and vertical BPF filtered and the data are nonlinear LPF filtered, and the sum of the filtered data is output as fifth interpolation data R' or B'.

2. The color signal interpolator of claim 1, wherein the horizontal linear LPF filtering is performed by multiplying the pixel data in each of the first, third, and fifth rows in 5x3 pixel data centered around the center pixel in the 5 x 5 pixel window, by the horizontal LPF filtering weight (1 0 1), and averaging the product thereof, and setting the average value as the center value of the row; and the vertical linear LPF filtering is performed by multiplying the pixel data in each of first, third, and fifth columns in the 3x5 pixel data centered around the center pixel in the 5 x 5 pixel window, by the vertical LPF filtering weight

$$\begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix},$$

and averaging the product thereof, and setting the average value as the center value of the column.

3. The color signal interpolator of claim 1, wherein the horizontal BPF filtering is performed by multiplying pixel data in the row to which the center pixel belongs within the 5 x 5 pixel window, by the horizontal BPF filtering weight (-1 0 2 0 -1) and then averaging the result, and the vertical BPF filtering is performed by multiplying pixel data in the column to which the center pixel belongs within the 5 x 5 pixel window, by the vertical BPF filtering weight

$$\begin{pmatrix} -1 \\ 0 \\ 2 \\ 0 \\ -1 \end{pmatrix},$$

and then averaging the product thereof.

4. The color signal interpolator of claim 1, wherein the HPF filtering is performed by multiplying the 3x3 pixel data centered around the center pixel in the

5 x 5 pixel window by the HPF filtering weight

$$\begin{pmatrix} -1 & 0 & -1 \\ 0 & 4 & 0 \\ -1 & 0 & -1 \end{pmatrix},$$

and then averaging the product.

5. The color signal interpolator of claim 1, wherein the nonlinear LPF filtering of the 5 x 5 pixel window is performed by: outputting interpolation data G' and B' by performing equations 1 and 2, respectively, for center pixel R; outputting interpolation data G' and R' by performing the equations 1 and 2, respectively, for center pixel B: and outputting interpolation data B' and R' by performing equations 3 and 4, respectively, for both center pixels Gr and Gb.

6. The color signal interpolator of claim 5,

wherein the equations 1 through 4 are:

$$C_{y,x} = \frac{(a_1 C_{y-1,x} + a_3 C_{y,x+1} + a_5 C_{y+1,x} + a_7 C_{y,x-1})}{(a_1 + a_3 + a_5 + a_7)} \quad \text{.....(1)}$$

$$C_{y,x} = \frac{(a_2 C_{y-1,x+1} + a_4 C_{y+1,x+1} + a_6 C_{y+1,x-1} + a_8 C_{y-1,x-1})}{(a_2 + a_4 + a_6 + a_8)} \quad \text{.....(2)}$$

$$C_{y,x} = \frac{(a_1 C_{y-1,x} + a_5 C_{y+1,x})}{(a_1 + a_5)} \quad \text{.....(3)}$$

$$C_{y,x} = \frac{(a_3 C_{y,x+1} + a_7 C_{y,x-1})}{(a_3 + a_7)} \quad \text{.....(4)}$$

where $C_{y,x}$ denotes a pixel data in y-th row and x-th column within the 5 x 5 pixel window centered around the center pixel; and a1 through a8, $D_{y+a,\ x+b}$ and D1 through D8 are calculated by the following equations:

$$a_1 = \frac{1}{(1 + D_{y-1,x} + D_1/8)} \qquad a_2 = \frac{1}{(1 + D_{y-1,x+1} + D_2/8)}$$

$$a_3 = \frac{1}{(1 + D_{y,x+1} + D_3/8)} \qquad a_4 = \frac{1}{(1 + D_{y+1,x+1} + D_4/8)}$$

$$a_5 = \frac{1}{(1 + D_{y+1,x} + D_5/8)} \qquad a_6 = \frac{1}{(1 + D_{y+1,x-1} + D_6/8)}$$

$$a_7 = \frac{1}{(1 + D_{y,x-1} + D_7/8)} \qquad a_8 = \frac{1}{(1 + D_{y-1,x-1} + D_8/8)}$$

$$D_{y+a,x+b} = \left| \frac{(C_{y+2a,x+2b} - C_{y,x})}{(2a + 2b)} \right|$$

$$D_1 = D_5 = \left| \frac{(C_{y-1,x} - C_{y+1,x})}{2} \right| \qquad D_2 = D_6 = \left| \frac{(C_{y-1,x+1} - C_{y+1,x-1})}{4} \right|$$

$$D_3 = D_7 = \left| \frac{(C_{y,x+1} - C_{y,x-1})}{2} \right| \qquad D_4 = D_8 = \left| \frac{(C_{y+1,x+1} - C_{y-1,x-1})}{4} \right|$$

7. A digital image signal processor comprising:

a memory unit that receives input pixel data, updates and stores pixel data of 5 pixel lines or more, and according to the control of a control signal, outputs 5 x 5 pixel window data centered on a center pixel;

a color signal interpolator that performs first group interpolation through fourth group interpolation, according to the control of the control signal, wherein: in the first group interpolation, interpolation data G', B', and R' are output through first

interpolation, second interpolation, and third interpolation, respectively, for center pixel R within the 5 x 5 pixel window data; in the second group interpolation, interpolation data G', R', and B' are output through the first interpolation, the second interpolation, and the third interpolation, respectively, for center pixel B within the 5 x 5 pixel window data; in the third group interpolation, interpolation data G', B', and R' are output through the third interpolation, fourth interpolation, and fifth interpolation, respectively, for center pixel Gr within the 5 x 5 pixel window data; and in the fourth group interpolation, interpolation data G', R', and B' are output through the third interpolation, the fourth interpolation, and the fifth interpolation, respectively, for center pixel Gb within the 5 x 5 pixel window data; and

a control unit that determines which color among colors R, B, Gr, and Gb the center pixel is, and according to the color of the center pixel, generates the control signal indicating the first group interpolation through the fourth group interpolation.

8. The digital image signal processor of claim 7, wherein the color signal interpolator comprises:

a first interpolator which receives the 5 x 5 pixel window data, performs first interpolation for each of the center pixels R and B, wherein: data are horizontal linear LPF filtered and vertical BPF filtered; data are vertical linear LPF filtered and horizontal BPF filtered; and data are nonlinear LPF filtered; and the sum of the filtered data is output as the interpolation data G';

a second interpolator which receives the 5 x 5 pixel window data, performs second interpolation from each of the center pixels R and B, wherein data are HPF filtered and data are nonlinear LPF filtered and the sum of the filtered data is output as the interpolation data B' or R', respectively;

a third interpolator which receives the 5 x 5 pixel window data, performs third interpolation from each of the center pixels R, B, and G, wherein data are

vertical BPF filtered and data are horizontal BPF filtered, and the sum of the filtered data is output as the interpolation data R', B', or G', respectively;

a fourth interpolator which receives the 5 x 5 pixel window data, performs fourth interpolation from each of the center pixels Gr and Gb, wherein data are vertical linear LPF filtered and horizontal BPF filtered and data are nonlinear LPF filtered and the sum of the filtered data is output as the interpolation data B' or R', respectively; and

a fifth interpolator which receives the 5 x 5 pixel window data, performs fifth interpolation from each of the center pixels Gr and Gb, wherein data are horizontal linear LPF filtered and vertical BPF filtered and data are nonlinear LPF filtered and the sum of the filtered data is output as the interpolation data R' or B', respectively.

9. A color signal interpolation method comprising:

receiving 5 x 5 pixel window data, performing first interpolation from each of center pixels R and B, in which data that are horizontal linear low pass filter (LPF) filtered and vertical band pass filter (BPF) filtered, data that are vertical linear LPF filtered and horizontal BPF filtered, and data that are nonlinear LPF filtered are added, and outputting interpolation data G';

receiving the 5 x 5 pixel window data, performing second interpolation from each of center pixels R and B, in which data that are high pass filter (HPF) filtered and the data that are nonlinear LPF filtered are added, and outputting interpolation data B' or R', respectively;

receiving the 5 x 5 pixel window data, performing third interpolation from each of center pixels R, B, and G, in which the data that are vertical BPF filtered and the data that are horizontal BPF filtered are added, and outputting interpolation data R', B', or G', respectively;

receiving the 5 x 5 pixel window data, performing fourth interpolation from each of center pixels Gr and Gb, in which the data that are vertical linear LPF

filtered and horizontal BPF filtered and the data that are nonlinear LPF filtered are added, and outputting interpolation data B' or R', respectively; and

receiving the 5 x 5 pixel window data, performing fifth interpolation from each of center pixels Gr and Gb, in which the data that are horizontal linear LPF filtered and vertical BPF filtered and the data that are nonlinear LPF filtered are added, and outputting interpolation data R' or B', respectively.

10. The color signal interpolation method of claim 9, wherein: the horizontal linear LPF filtering is performed by multiplying the pixel data in each of first, third, and fifth rows in the 5x3 pixel data centered around the center pixel in the 5 x 5 pixel window, by the horizontal LPF filtering weight (1 0 1), and averaging the product, and setting the average value as the center value of the row; and the vertical linear LPF filtering is performed by multiplying pixel data in each of first, third, and fifth columns in the 3x5 pixel data centered around the center pixel in the 5 x 5 pixel window, by the vertical LPF filtering weight

$$\begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix},$$

and averaging the product, and setting the average value as the center value of the column.

11. The color signal interpolation method of claim 9, wherein: the horizontal BPF filtering is performed by multiplying pixel data in the row to which the center pixel belongs in the 5 x 5 pixel window, by the horizontal BPF filtering weight (-1 0 2 0 -1) and then averaging the product; and the vertical BPF filtering is performed by multiplying pixel data in the column to which the center pixel belongs in the 5 x 5 pixel window, by the vertical BPF filtering weight

$$\begin{pmatrix} -1 \\ 0 \\ 2 \\ 0 \\ -1 \end{pmatrix},$$

and then averaging the product.

12. The color signal interpolation method of claim 9, wherein the HPF filtering is performed by multiplying 3x3 pixel data centered around the center pixel in the 5 x 5 pixel window by the HPF filtering weight

$$\begin{pmatrix} -1 & 0 & -1 \\ 0 & 4 & 0 \\ -1 & 0 & -1 \end{pmatrix},$$

and then averaging the product.

13. The color signal interpolation method of claim 9, wherein the nonlinear LPF filtering of the 5 x 5 pixel window data is performed by: outputting interpolation data G' and B' by performing equations 1 and 2, respectively, for center pixel R; outputting interpolation data G' and R', by performing the equations 1 and 2, respectively, for center pixel B; and outputting interpolation data B' and R' by performing equations 3 and 4, respectively, for both center pixels Gr and Gb.

14. The color signal interpolation method of claim 13, wherein the equations 1 through 4 are:

$$C_{y,x} = \frac{(a_1 C_{y-1,x} + a_3 C_{y,x+1} + a_5 C_{y+1,x} + a_7 C_{y,x-1})}{(a_1 + a_3 + a_5 + a_7)} \quad \text{.....(1)}$$

$$C_{y,x} = \frac{(a_2 C_{y-1,x+1} + a_4 C_{y+1,x+1} + a_6 C_{y+1,x-1} + a_8 C_{y-1,x-1})}{(a_2 + a_4 + a_6 + a_8)} \quad \text{.....(2)}$$

$$C_{y,x} = \frac{(a_1 C_{y-1,x} + a_5 C_{y+1,x})}{(a_1 + a_5)} \quad \text{.....(3)}$$

$$C_{y,x} = \frac{(a_3 C_{y,x+1} + a_7 C_{y,x-1})}{(a_3 + a_7)} \quad \text{.....(4)}$$

where $C_{y,x}$ denotes a pixel data in y-th row and x-th column of the 5 x 5 window centered around the center pixel; and a1 through a8, $D_{y+a,\ x+b}$ and D1 through D8 are calculated by the following equations:

$$a_1 = \frac{1}{(1 + D_{y-1,x} + D_1/8)} \qquad a_2 = \frac{1}{(1 + D_{y-1,x+1} + D_2/8)}$$

$$a_3 = \frac{1}{(1 + D_{y,x+1} + D_3/8)} \qquad a_4 = \frac{1}{(1 + D_{y+1,x+1} + D_4/8)}$$

$$a_5 = \frac{1}{(1 + D_{y+1,x} + D_5/8)} \qquad a_6 = \frac{1}{(1 + D_{y+1,x-1} + D_6/8)}$$

$$a_7 = \frac{1}{(1 + D_{y,x-1} + D_7/8)} \qquad a_8 = \frac{1}{(1 + D_{y-1,x-1} + D_8/8)}$$

$$D_{y+a,x+b} = \left| \frac{(C_{y+2a,x+2b} - C_{y,x})}{(2a + 2b)} \right|$$

$$D_1 = D_5 = \left| \frac{(C_{y-1,x} - C_{y+1,x})}{2} \right| \qquad D_2 = D_6 = \left| \frac{(C_{y-1,x+1} - C_{y+1,x-1})}{4} \right|$$

$$D_3 = D_7 = \left| \frac{(C_{y,x+1} - C_{y,x-1})}{2} \right| \qquad D_4 = D_8 = \left| \frac{(C_{y+1,x+1} - C_{y-1,x-1})}{4} \right|$$

15. A digital image signal processing method comprising:

receiving input pixel data, storing pixel data of 5 pixel lines or more, and according to the control of a control signal, outputting 5 x 5 pixel window data centered around a center pixel;

performing color signal interpolation by performing first group interpolation through fourth group interpolation according to the control of the control signal, wherein: in the first group interpolation, interpolation data G', B', and R' are output through first interpolation, second interpolation, and third interpolation, respectively, using the 5 x 5 pixel window data for center pixel R; in the second group interpolation, interpolation data G', R', and B' are output through the first interpolation, the second interpolation, and the third interpolation, respectively, using the 5 x 5 pixel window data for center pixel B; in the third group interpolation, interpolation data G', B', and R' are output through the third interpolation, fourth interpolation, and fifth interpolation, respectively, using the 5 x 5 pixel window data for center pixel Gr; and in the fourth group interpolation, interpolation data G', R', and B' are output through the third interpolation, the fourth interpolation, and the fifth interpolation, respectively, using the 5 x 5 pixel window data for center pixel Gb; and

and according to the color of the center pixel among colors R, B, Gr, and Gb, generating the control signal indicating the first group interpolation through the fourth group interpolation.

16. The digital image signal processing method of claim 15, wherein performing color signal interpolation comprises:

receiving the 5 x 5 pixel window data, performing first interpolation from each of the center pixels R and B, wherein the data are horizontal linear LPF

filtered and vertical BPF filtered, and the data are vertical linear LPF filtered and horizontal BPF filtered, and the data are nonlinear LPF filtered and the sum of the filtered data is output as the interpolation data G';

receiving the 5 x 5 pixel window data, performing second interpolation for each of the center pixels R and B, wherein the data are HPF filtered and the data are nonlinear LPF filtered and the sum of the filtered data is output as the interpolation data B' or R';

receiving the 5 x 5 pixel window data, performing third interpolation for each of the center pixels R, B, and G, wherein the data are vertical BPF filtered and the data are horizontal BPF filtered and the sum of the filtered data is output as the interpolation data R', B', or G';

receiving the 5 x 5 pixel window data, performing fourth interpolation for each of the center pixels Gr and Gb, wherein the data are vertical linear LPF filtered and horizontal BPF filtered; and the data are nonlinear LPF filtered and the sum of the filtered data is output as the interpolation data B' or R'; and

receiving the 5 x 5 pixel window data, performing fifth interpolation for each of the center pixels Gr and Gb, wherein the data are horizontal linear LPF filtered and vertical BPF filtered; and the data are nonlinear LPF filtered and the sum of the filtered data is output as the interpolation data R' or B'.